REMARKS

Allowable Subject Matter

Applicants gratefully acknowledge the Examiner's indication the claims 8, 9, 13, 18, and 44 recite allowable subject matter. See page 20 of the July 27, 2011 Office Action.

Amendments

Claim 1 is amended to provide express antecedent basis for the polymer precursor. In addition, claim 1 is amended to recite the concentration range of 0.5 to 4 % by weight for the at least one reactive mesogen from claim 14 (now cancelled). Claims 4, 6, 28, 30, 32, and 33 are amended to use language that is consistent the language of amended claim 1.

Claim 8 is amended to be in independent form. Claim 9 is amended to depend from claim 8, and claim 13 is amended to depend from claim 9. Claim 10 is amended to recite that the concentration of the at least one reactive mesogen additive in the command layer is 0.5 to 4 % by weight. See prior claim 14.

Claim 15 is amended to provide antecedent basis for the polymer precursor and to recite that the polymer or a polymer precursor comprises a polyimide polymer or a precursor of said polyimide polymer. Claim 15 is also amended to recite that the concentration of the at least one reactive mesogen in the solution is 0.5 to 4% by weight. See prior claim 14. Claims 45 and 46 are amended to use language that is consistent the language of amended claim 15.

Claim 49 is amended to recite that the at least one reactive mesogen additive contains a polymerizable group selected from acrylate, methacrylate, and oxetane. See, for example, page 16, lines 15-18. Claim 56 is amended to recite that the alignment layer contains one reactive mesogen additive and the polymerizable liquid crystal material is a liquid crystal. See, for example, the Example and page 18-26.

Claims 2, 5, 14, 22-24, 27, 29, 42, 47, and 51-55 are cancelled. New claims 57-63 are directed to further aspects of the invention and are supported throughout the disclosure. See, for example, prior claims 1, 15, 43,-46, and 48, page 14, lines 6-8, and page 16, lines 15-18.

Rejection under 35 USC 112, second paragraph

Claims 15, 42-48, and 51-55 are rejected as being indefinite under 35 USC 112,

second paragraph. This rejection is respectfully traversed.

In the rejection, it is argued that the use of the terms "polymer precursor solution," "polymer component," and "polymer precursor" render the claim language unclear. While applicants disagree that the prior claim language is unclear to one of ordinary skill in the art, claim 15 is amended to use the terms "solution," "polymer," and "polymer precursor."

As for claims 51-55, the rejection has been rendered moot by the cancellation of these claims.

In view of the above remarks, withdrawal of the rejection is respectfully requested.

Rejection under 35 USC 102(b) in view of Kumar et al.

Claims 1-6, 14, 22-24, 27, 28, and 31-33 are rejected as being anticipated under 35 USC 102(b) in view of Kumar et al. (WO 01/18594; US 6,939,587). This rejection is respectfully traversed.

As discussed previously, Kumar et al. disclose a procedure for making light modulating devices made with composite organic materials utilizing self-aligned layers. The procedure can be performed via a one-step process or a multi-step process to prepare aligned liquid crystal films adjacent a polymer layer. See the abstract.

The rejection refers to the disclosure at column 8, lines 8-25 where Kumar et al. describes one embodiment of the one-step process. In the process, a mixture is prepared containing a liquid crystal material, a prepolymer, and a polarization-sensitive aligning agent. The mixture is deposited on a substrate and irradiated with light. This induces polymerization of the prepolymer, and, as polymerization proceeds, phase separation between the liquid crystal material and the polymer/aligning agent occurs. Kumar et al. refer to this as "polymerization induced phase separation."

Thus, this one-step process of Kumar et al. involves forming parallel films of an aligning polymer and an aligned reactive liquid crystal monomer using a precursor solution that contains the alignment polymer precursor and the reactive liquid crystal monomer. Upon irradiation with polarized UV light the polymer precursor is polymerized, and the polymerized precursor and the liquid crystal monomer phase-separate into two parallel films. One of these films is the alignment polymer layer (see layer 40 in Figure 2 and layer 63 or 68 in Figure 3), and the other is a liquid crystal layer which acts as light modulating layer in the

light modulating device (see layer 42 in Figure 2 and layer 66 in Figure 3).

In the rejection, it is asserted that during the formation of these two parallel films, a very small amount of residual reactive mesogen additive (i.e., reactive liquid crystal monomer) will become physically trapped within the alignment polymer layer. Even if this is correct, the further assertion in the rejection that the amount of reactive liquid crystal monomer remaining in the alignment polymer layer would be expected "to be within a range that overlaps the claimed range of 0.5 to 4% by weight" is pure speculation. The rejection presents no rationale as to what amount, if any, of the reactive liquid crystal monomer will remain in the alignment polymer layer.

Since the focus of the Kumar et al. one step process is to provide two films, and thus the purpose the reactive liquid crystal monomer in the precursor material is to form the separate liquid crystal film, one would expect that, as a result of the phase separation to form the alignment polymer film and the liquid crystal film, most if not all of the reactive liquid crystal monomer will be found in the resultant liquid crystal layer, not in the alignment layer.

But, in any event, if as argued in the rejection, the amount of reactive liquid crystal monomer remaining in the alignment layer of Kumar et al. after phase separation is expected to be "very small" and "well within the range from 0.5% to 4%", then the amount of the reactive liquid crystal monomer present in the precursor material before phase separation must be much higher than 0.5% to 4%. Compare applicants' claim 1.

In view of the above remarks, it is respectfully submitted that the disclosure of Kumar et al. fails to anticipate applicants' claimed invention under 35 USC 102(b). Withdrawal of the rejection is respectfully requested.

Rejection under 35 USC 102(b) in view of Winkler

Claims 19-21 are rejected as being anticipated under 35 USC 102(b) in view of Winkler (US 6,538,712). This rejection is respectfully traversed.

As described at column 6, lines 45-60, Winkler (US '712) discloses an O-plate compensator that comprises a polymerized reactive liquid crystal thin film and a rubbed polymer alignment layer. The alignment layer incorporates a polyimide with bulky side-chain groups, and is produced by solvent casting a thin film of polyimide material onto a substrate. The polyimide surface is then mechanically buffed, and a thin film of reactive liquid crystal

material is deposited onto the polyimide alignment layer, also using a solvent casting technique. The solvent is evaporated and the reactive liquid crystal film is photopolymerized using ultraviolet light.

The rejection refers to the disclosure at column 7-8 Winkler (US '712), which describes the process embodiment shown in Figure 4. In this embodiment, a liquid crystal alignment layer, consisting of a polyimide polymer material incorporating a plurality of bulky side-chain groups, is deposited onto an optically transparent substrate. Depositing of the alignment layer is preferably performed by solvent casting. The alignment layer material is dissolved in a solvent, a thin film of the solution is applied to the surface of the substrate, and then the solvent is evaporated off leaving a thin film alignment layer. The solvents mentioned are toluene, monochlorobenzene, methylethylketone, cyclohexanone, and propyleneglycol-monomethyletheracetate (PGMEA). See column 7, line 45 – column 8, line 21.

After buffing the alignment layer, a thin film of polymerizable liquid crystal material (such as acrylates, epoxides, or vinyl ethers) is deposited onto the alignment layer. According to one embodiment, a polymerizable liquid crystal material is solvent cast onto the alignment layer using monochlorobenzene as solvent. The liquid crystal thin film is then polymerized via illumination with actinic radiation.

In the rejection, it is argued that the solvent (monochlorobenzene) used for preparing the alignment layer by solvent casting can be the same as the solvent used for solvent casting the polymerizable liquid crystal material. Thus, the rejection concludes that in such a case, during solvent casting of the polymerizable liquid crystal material, the solvent will act as a carrier for infiltration of the polymerizable liquid crystal material into the alignment layer.

However, this conclusion is speculation. Winkler (US '712) provides no disclosure or suggestion that in such an embodiment the polymerizable liquid crystal material will infiltrate into the alignment layer. Even if one might assert that the solvent used during solvent casting of the polymerizable liquid crystal material will have some impact on the alignment layer, there is nothing within the disclosure of Winkler (US '712) that suggests infiltration of the polymerizable liquid crystal material. Furthermore, the rejection merely concludes that infiltration will occur, but provides no rational as to why such alleged infiltration will necessarily and always occur. See, for example, *Schering Corp. v. Geneva Pharmaceutical Inc.,* 67 USPQ2d (Fed. Cir. 2003).

In any event, the disclosure of Winkler (US '712) does not suggest a process in accordance with applicants' amended claim 1. For example, Winkler (US '712) does not describe or suggest forming an alignment layer by depositing onto a surface a layer of a solution containing a polymer/polymer precursor, and processing the layer of solution to form the alignment layer, wherein at least one reactive mesogen additive is incorporated into the layer of solution before the processing, and the concentration of the at least one reactive mesogen additive in the is 0.5 to 4 % by weight.

In view of the above remarks, it is respectfully submitted that the disclosure of Winkler fails to anticipate applicants' claimed invention under 35 USC 102(b). Withdrawal of the rejection is respectfully requested.

Rejections under 35 USC 103(a) in view of Kumar et al.

Claims 34, 35, and 56 are rejected as being obvious under 35 USC 103(a) in view of Kumar et al. (WO 01/18594; US 6,939,587). In addition, claims 10, 11, 15, 42, 47, 48, 51, 52, 54, and 55 are also rejected as being obvious under 35 USC 103(a) in view of Kumar et al. These rejections are respectfully traversed.

The disclosure of Kumar et al. is discussed above. Kumar et al. do not describe or suggest a method of forming an alignment layer by depositing onto a surface a layer of a solution containing at least one reactive mesogen additive and a polymer or polymer precursor, and then processing the layer of solution to form the alignment layer, wherein the concentration of the at least one reactive mesogen additive in the solution is 0.5 to 4 % by weight.

With regards to claim 34, it is argued that Kumar et al. disclose using heat treatment and solvent evaporation for forming the alignment layer, citing column 8, lines 65-66. However, this disclosure relates to Kumar et al.'s multi-step process, not the one-step process relied on in the rejection wherein parallel films of an aligning polymer and an aligned reactive liquid crystal monomer are formed via phase separation.

With regards to claim 56, it is asserted that Kumar et al.'s phase separated polymerized liquid crystal layer would be expected to be chemically bound to the alignment layer. However, this alleged expectation is mere speculation as there is nothing presented within the rejection that justifies the expectation that a reactive mesogenic additive is present

within the alignment layer in a sufficient amount and properly positioned to react with the polymerizable liquid crystal material.

Moreover, Kumar et al. do not disclose or suggest a laminate wherein the alignment film contains one reactive mesogen and the liquid crystal film contains another reactive mesogen. Since the liquid crystal film of Kumar et al. is formed from the same material as alleged residual reactive liquid crystal monomer in the alignment layer, it is not possible that any residual liquid crystal monomer in the alignment layer of Kumar et al. is different than the liquid crystal monomer used to form the liquid crystal film.

Furthermore, while claim 56 is a product-by-process claim, the rejection provides no explanation as to why the structure of a alignment layer/polymerizable liquid crystal layer combination formed via phase separation would be expected to be the same as the structure resulting from the different process steps recited in applicant's claim 18.

With regards to claim 10, Kumar et al. provide no disclosure or suggestion of a forming a command layer from a solution containing one or more compounds for the command layer and at least one reactive mesogen, wherein the concentration of the at least one reactive mesogen additive in the solution is 0.5 to 4 % by weight.

With regards to claim 15, the rejection asserts that the amount of 0.5 to 4% by weight of reactive mesogen additive "in a polymer precursor solution ... used for solution coating is very common, used for the purpose of providing the desired thin coating". This argument is conclusory and unsupported by any evidence. If the Examiner maintains this assertion, applicants respectfully request the Examiner to present evidence in support of this argument.

But, in any event, the use of such a relatively low amounts of reactive mesogen additive in the precursor materials would be contrary to the process of Kumar et al. In the Kumar et al. one-step process relied on in the rejection, the precursor materials must contain sufficient reactive liquid crystal monomers to form the polymerized liquid crystal layer, and thus the amount of liquid crystal monomers would be quite high.

In view of the above remarks, it is respectfully submitted that the disclosure of Kumar et al. et al. fails to render obvious applicants' claimed invention under 35 USC 103(a). Withdrawal of the rejection is respectfully requested.

Rejection under 35 USC 103(a) in view of Kumar et al. and Tsuboyama et al.

Claim 7 is rejected as being obvious in view of Kumar et al. (WO 01/18594; US 6,939,587) in combination with Tsuboyama et al. (US 5,099,344). This rejection is respectfully traversed.

The disclosure of Kumar et al. is discussed above. In the rejection, it is acknowledged that Kumar et al. fail to disclose an alignment layer which comprises a polyimide film in accordance with applicants' claim 7. In the rejection, it is argued that Tsuboyama et al. disclose such a polyimide alignment layer. See column 4, lines 8-18.

However, the disclosure of Tsuboyama et al. does not overcome the deficiencies in the disclosure of Kumar et al., as discussed above. Tsuboyama et al. provide no suggestion of the presence of reactive mesogenic additives in the alignment layer. Thus, Tsuboyama et al. provide no suggestion as to a process for making an alignment layer containing reactive mesogenic additives. As a result, Tsuboyama et al. provide no suggestion as to how one would modify the procedure disclosed by Kumar et al. in such a manner as to arrive at a method in accordance with applicants' claimed method.

In view of the above remarks, it is respectfully submitted that the disclosure of Kumar et al., taken alone or in combination with the disclosure of Tsuboyama et al, fails to render obvious applicants' claimed invention. Withdrawal of the rejection is respectfully requested.

Rejections under 35 USC 103(a) in view of Kumar et al. and Winkler (US '634)

Claims 12 and 29-30 are rejected as being obvious in view of Kumar et al. (WO 01/18594; US 6,939,587) in combination with Winkler (US 6,320,634). In addition, claims 43 and 53 are also rejected as being obvious in view of Kumar et al. and Winkler (US 6,320,634). These rejections are respectfully traversed.

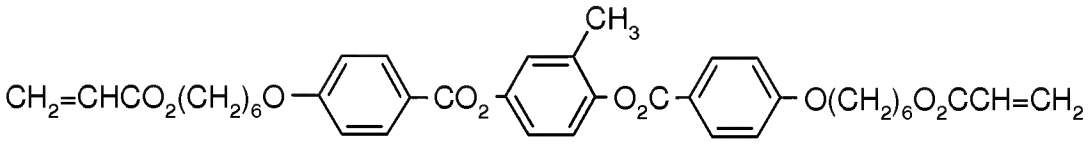
The disclosure of Kumar et al. is discussed above. In the rejection it is acknowledged that Kumar et al. do not disclose details on reactive liquid crystal monomers, other than that it is possible for the liquid crystal monomers to be diacrylates, citing column 8, lines 45-50. However, it is noted that this portion of the disclosure relates to a different embodiment of the Kumar et al. one-step process then the phase separation process relied on in the rejection. In this alternative one-step process, there is no phase separation step (and thus no basis for the asserted expectation regarding the presence of reactive liquid crystal monomers within the

alignment layer). Instead, the materials for forming the alignment are first spin coated onto the substrate to form a polyimide film. Then, the reactive liquid crystal monomers are spin coated onto the polyimide film.

It is also asserted in the rejection that Kumar et al. disclose that the reactive liquid crystal diacrylates can be used to form a birefringent layer, citing column 7, lines 25-30. However, this disclosure does not mention diacrylates. Instead, it refers to forming birefringent devices and does not mention the use of any particular materials for making birefringent layers.

Winkler (US '634) discloses an O-plate compensator for use with a liquid crystal display. The O-plate compensator is a uniaxial birefringent thin film comprising an organic liquid crystal polymer. The film can be cast from a liquid crystal polymer solution or from a reactive liquid crystal monomer. See column 9, lines 39-56.

The rejection refers to Fig. 12B of Winkler (US '634) which shows the chemical structure of a compound C6M, described as a conventional liquid crystal monomer:



In the rejection, it is asserted that it would be obvious to use a conventional liquid crystal monomer, such as C6M, as the polymerizable liquid crystal material in the display of Kumar et al. However, as noted above, Kumar et al. do not disclose the use of diacrylates in their one-step process for forming parallel films of an aligning polymer and an aligned reactive liquid crystal monomer via phase separation.

With regards to claim 30, as discussed above, the rejection presents no rationale regarding why one of ordinary skill in the art would expect the precursor material of the Kumar et al. one-step phase separation process to contain 0.5 to 4 % by weight of the reactive mesogen additive, let alone 1 to 2 % by weight.

In any event, the disclosure of Winkler (US '634) does not overcome the deficiencies in the disclosure of Kumar et al., as discussed above. Winkler (US '634) does not disclose or suggest an alignment layer that comprises a polymer film containing at least one reactive mesogen additive, wherein the additive has unreacted polymerizable groups after preparation of the alignment layer. As a result, Winkler (US '634) provides no suggestion as to how one

would modify the procedure disclosed by Kumar et al. in such a manner as to arrive at a method in accordance with applicants' claimed method.

In view of the above remarks, it is respectfully submitted that the disclosure of Kumar et al., taken alone or in combination with the disclosure of Winkler (US '634), fails to render obvious applicants' claimed invention. Withdrawal of the rejection is respectfully requested.

Rejection under 35 USC 103(a) in view of Kumar et al. and Komatsu et al.

Claims 25, 26, 36, and 37 are rejected as being obvious in view of Kumar et al. (WO 01/18594; US 6,939,587) in combination with Komatsu et al. (US 5,989,758). In addition, claims 45 and 46 are also rejected as being obvious in view of Kumar et al. and Komatsu et al. These rejections are respectfully traversed.

The disclosure of Kumar et al. is discussed above. It is acknowledged in the rejection that Kumar et al. fails to disclose the birefringence of the alignment layer. However, it is argued that Komatsu et al. disclose an orientation substrate which is "optically isotropic." See column 24, lines 14-19. In the rejection, it is further asserted that "optically isotropic" means a birefringence of ideally zero.

Komatsu et al. do not define what is meant by "optically isotropic." One of ordinary skill in the art reading the disclosure of Komatsu et al. does not know whether "optically isotropic" in the context of the disclosure means a birefringence of less than 1, less than 0.1, or zero, or some other value. Nothing within the disclosure of Komatsu et al. or within the rejection supports the conclusion that "optically isotropic," in the context of the Komatsu et al. disclosure, definitively means a birefringence of zero.

In any event, the disclosure of Komatsu et al. does not overcome the deficiencies in the disclosure of Kumar et al. as discussed above. Komatsu et al. provide no suggestion as to a process for making an alignment layer containing reactive mesogenic additives.

In view of the above remarks, it is respectfully submitted that the disclosure of Kumar et al., taken alone or in combination with the disclosure of Komatsu et al., fails to render obvious applicants' claimed invention. Withdrawal of the rejection is respectfully requested.

Rejection under 35 USC 103(a) in view of Schunk et al. and Hong

Claims 15, 42, and 47-50 are rejected as being obvious under 35 USC 103(a) in view

of Schunk et al. (US 2003/0080326) and Hong (US 2003/0236418). This rejection is respectfully traversed.

In the rejection, it is argued that Schunk et al. disclose a solution containing triacetate cellulose polymer and an additive UV-adsorbing monomeric compound, citing paragraphs [0042] and [0045]. In paragraph [0042], Schunk et al. disclose a process for preparing a UV filter element (optical polymer film) wherein a solvent, cellulose triacetate and a plasticizer are combined in one mixing vessel, and the cellulose acetate is dissolved. In another mixing vessel, a solvent and two ultraviolet absorbers are combined, and the absorbers are dissolved. An amount of the absorber solution is added to first vessel, and the resultant mixture is formed into a cast film which is dried to form a film having self-bearing properties.

In the rejection, it is asserted that Schunk et al. disclose that the UV absorbers used can be a mesogenic compound, citing Formula II-A in paragraph [0022]. The compound of Formula II-A is a hydroxyphenyl triazine. Paragraph [0022] of Schunk et al. does not indicate that this compound is mesogenic, nor does the rejection explain why the compound is said to be mesogenic.

It is argued in the rejection that the compound of Formula II-A is "reactive" because it has multiple hydroxy groups, and Hong teaches that such hydroxy groups are reactive, citing paragraph [0027] of Hong. In paragraph [0027], Hong described that the hydroxy groups of a UV absorbing compound A react with compound B which contains glycidyl and vinyl groups, thereby functionalizing compound A with reactive more than one vinyl groups. However, the rejection does not explain why the compound of Schunk et al.'s Formula II-A is itself considered to be a reactive mesogenic monomer compound.

Moreover, Schunk et al. do not disclose a solution containing a polyimide polymer or a precursor of a polyimide polymer, and at least one reactive mesogen, wherein the concentration of the at least one reactive mesogen in the solution is 0.5 to 4% by weight. See applicants' claim 15.

As for amended claim 49, neither Schunk et al. nor Hong disclose or suggest an alignment layer comprising: (a) a solvent processed cellulose based polymer film, and (b) at least one reactive mesogen additive in monomeric, oligomeric or polymeric form within the polymer film which contains a polymerizable group selected from acrylate, methacrylate, and oxetane. Nor do they disclose that, after preparation of such an alignment layer, the

alignment layer contains unreacted polymerizable groups from the reactive mesogen additive.

In view of the above remarks, it is respectfully submitted that the disclosure of Schunk et al., taken alone or in combination with the disclosure of Hong, fails to render obvious applicants' claimed invention. Withdrawal of the rejection is respectfully requested.

Rejection under 35 USC 103(a) in view of Schunk, Hong, and Komatsu et al.

Claims 45 and 46 are rejected as being obvious under 35 USC 103(a) in view of Schunk et al. (US 2003/0080326), Hong (US 2003/0236418), and Komatsu et al. (US 5,989,758). This rejection is respectfully traversed.

The disclosures of Schunk et al., Hong, and Komatsu et al. are discussed above. The disclosure of Komatsu et al. does not overcome the deficiencies in the combined disclosures of Schunk et al. and Hong discussed above. Komatsu et al. provide no suggestion as to a process for making an alignment layer containing reactive mesogenic additives.

In view of the above remarks, it is respectfully submitted that the disclosure of Schunk et al., taken alone or in combination with the disclosure of Hong and/or Komatsu et al., fails to render obvious applicants' claimed invention. Withdrawal of the rejection is respectfully requested.

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,

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